Antibiotic using trends in commercial poultry farms in Chattogram

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Table of Content

ABSTRACT

Antibiotics are used inappropriately and improvidently in Bangladeshi poultry farms to compensate for poor management methods and illiteracy. Despite this, no available data on antibiotic usage patterns or farm management strategies in poultry farms exist. The purpose of this study was to learn about the farmers' perspectives on antibiotic use in different clinical cases of poultry. A total of 100 prescriptions were collected from veterinary hospitals, poultry farmers, registered veterinarians' chamber, veterinary pharmacy of Sitakunda upazila of Chattogram district during February to August 2021. Among 100 clinical cases, the percentage of Infectious Bursal Disease was found 21%, Coccidiosis 20%, Colibacillosis 10%, Necrotic enteritis 5%, Salmonellosis 4% and other mixed infections were less than 10%. The use of antibiotics records for these diseases were calculated and analysed. Among the antibiotics levofloxacin was recorded 16.25%, ciprofloxacin 15%, enrofloxacin 12.50%, doxycycline 8.75%, colistin sulphate 6.25%, gentamicin 6.25%, norfloxacin 5% and combination of amoxicillin and levofloxacin 6.25%, enrofloxacin and levofloxacin 6.25% and others are less than 3%. The study reveals that antibiotics used inappropriately and in undisciplined manner to cure different types of clinical diseases of poultry such as viral and coccidian cases as well. Antibiotic residues and resistance are a consequence of this indiscriminate use of antibiotics. Therefore, government authorities should establish necessary enactment to reduce indiscriminate use of antibiotics.

Key words: Antibiotic usage, Clinical cases, Veterinarians, Infectious Bursal Disease, Coccidiosis, Colibacillosis, Necrotic enteritis, Salmonellosis, Antibiotic residues and resistant etc.

CHAPTER 01

INTRODUCTION

Antibiotic usage in animals and birds is an intense topic in veterinary medicine and public health. Antibiotics are compounds that are used to kill or stop germs from growing (Nita., 2007). They are considered one of the greatest breakthroughs of the 20th century. Antibiotics have been commonly utilized to treat bacterial illnesses in humans and animals since their discovery in the 1940s. However, by the 1970s, antibiotic overuse had contributed to increase in drug-resistant pathogens, also known as superbugs. Antibiotics have been considered ineffective against the dangerous infections as a consequence of this resistance. Antibiotic resistance has been recognized as a major public health issue all around world (Nisha., 2008). It is now recognized by the major world health organization's one of the most pressing health issues of current day. Some of the causes are well-known, including the use of antibiotics as growth promoters in livestock or poultry feed, the overuse and inappropriate use of antibiotics for nonbacterial disease, and improper or indiscriminate antibiotic use in clinical situations (Donoghue., 2003).

The major antibiotics used in humans either belong to the same general classes as which are used in animals or have the same mode of action. Many antibiotics used to treat bacterial infections in humans were used to treat bacterial infections in animals. Antibiotics were first used to cure or prevent disease in animals, and then they were also used to treat or prevent disease in humans. Antibiotics are now used to prevent, control, and treat infections, as well as to improve animal development and feed efficiency (Tollefson *et al.,* 2000). Antibiotics are used at lower concentrations than those used for treatment in the latter two cases, which is a potentially risky technique because it can promote the growth of antibiotic-resistant bacteria, allergic reactions, and technological issues in fermented meat products (Paige *et al.,* 1997). Some antibiotics are toxic in and of itself, while allergic reactions and toxic side effects from many others can be lethal (Collignon., 2003). Approximately 80% of all food-producing animals are currently treated for part or all of their lives. Antibiotic use, particularly in poultry, has aided efficient production while also improving poultry health and wellbeing by reducing disease incidence.

Antibiotics are now commonly used in poultry farming for therapeutic purposes, but they are added in sub-therapeutic doses into feed and water for prophylaxis and growth promotion (Apata., 2009). However, farmers, particularly commercial broiler farmers in Bangladesh, use antibiotics indiscriminately and without veterinary consultation or advice. Farmers are driven to use antibiotics indiscriminately due to unawareness, a lack of proper veterinary services in the rural areas, and a drive for high profits. In some cases, the antibiotics used in the growth-promoter category are also utilized in the therapeutic category. In commercial poultry, the decision to use growth-promoter antibiotics is primarily based on economic considerations, like whether the improvements in body weight, feed efficiency, and/or growth rates are worth the antibiotic's cost. Moreover, antibiotics are openly accessible in Bangladeshi drug stores without a prescription. As a consequence of this practice, antibiotics have been abused, leading to a high prevalence of antibiotic resistance among bacteria from animal and food sources (Ferdous *et al.,* 2019).

Antibiotics tend to build up in tissues and organs, forming residues of varying concentrations. Antibiotic residues in food above the maximum level considered illegal by various public health authorities around the world, and their consumption can result to public health risks such as the development of resistant microorganisms, hypersensitivity reactions in sensitive people, and a disruption of intestinal microflora (Ferdous *et al.,* 2019). As a result, antibiotic residues in animal-based foods are a source of concern among the general public and medical professionals. Animal drug residues in human food are acutely or cumulatively allergic, organ toxic, mutagenic, teratogenic, or carcinogenic, posing a hazard to human health (Reyher *et al.*, 2017*).* Penicillin violative residues, for example, are among the most commonly recognized causes of allergic reactions in people who ingest animal products that contain residues. Other drugs that can cause allergy symptoms include tetracyclines, sulphonamides, and amino-glycosides. Drug resistance appears to be the most serious threat posed by drug residues globally (Paige *et al.,* 1997). The resistant bacteria could subsequently cause disease in humans that is difficult to cure, and the resistant gene could be passed on to other human infections.

As a result, consumer safety depends on investigations into the indiscriminate use of antibiotics and the identification of antibiotic residues in foods of animal origin intended for human consumption (Alhaji *et al.,* 2018). To date, no comprehensive work has been reported in Bangladesh on the indiscriminate use of antibiotics and their levels of residues in terms of

public health. Detecting drug residues in tissues and other animal products could be a costly, time-consuming, and labor-intensive endeavor. Microbiological approaches are ideal for detecting antimicrobial residues because they are less expensive than immunochemical and chromatographic methods and can screen several samples (Ferdous *et al.,* 2019).

Many microbiological tests have been developed to detect antibiotic residues, and the most of them are relatively inexpensive to use. The availability of simply and reliable screening systems for the detection of antibiotics is an essential tool in assuring the safety of food products. The aim of this study was to document the ways in which antibiotics are used in broiler production in Bangladesh. The study also aimed to identify the several veterinary antibiotics used in commercial broiler farming and determine the number of residues present in poultry products in order to determine the public health implications.

CHAPTER 02

METHODOLOGY

Materials and Methods

Study Area:

The study was conducted in Sitakunda Upazila of Chattogram district. This place was chosen by Director of External Affairs as one of the internship placements for DVM internship program at Chittagong Veterinary and Animal Sciences University (CVASU).

Study Design and Setting:

This study was conducted from February to August 2021 in different parts of Sitakunda Upazila and included areas well known for commercial poultry production. A total of 100 prescriptions were collected to achieve the most reliable and comprehensive scenario of antibiotic use in commercial poultry farms of Sitakunda Upazila of Chattogram District.

Data Collection:

Prescriptions were collected from veterinary hospital, poultry farmers, registered veterinarians and vet pharmacy which was prescribed by registered veterinarians. All necessary information was collected through personal interview of the farm owner. Additional data was gathered on the total population of farms, the age of the birds, the number of sheds, the respondent's educational status, and so on. During the survey, all leftover antibiotic packets and bottles were collected and recorded in order to acquire precise data on antibiotic usage. In addition, physical inspection on the use of antibiotics in farms was also conducted.

Tentative Diagnosis: Tentative diagnosis were confirmed by registered veterinarians based on post mortem examination based on some pathognomic clinical observations (Table 01).

Table 01: Tentative diagnosis of Clinical diseases based on post mortem examinations

Serial No.	Post mortem examination	Tentative Diagnosis
01	Haemorrhage in muscle, Bursa swollen, Kidney swollen, Haemorrhage in Trachea	Infectious Bursal Disease (IBD)
02	Haemorrhage in proventriculus, Button ulcer in Intestine	Newcastle Disease (ND)
03	Pericarditis, Perihepatitis, liver swollen, Air sacculitis, Kidney swollen	Colibacillosis
04	Haemorrhage in Coronary groove of liver, Haemorrhage in liver, Kidney swollen, Cyanosis in comb and wattle	Fowl Cholera (FC)
05	White faces around anus, haemorrhage in intestine, liver swollen	Salmonellosis
06	Haemorrhage in intestine, Clotted blood, Gas found in intestine, Pseudo membrane present	Necrotic Enteritis (NE)
07	Haemorrhage in Trachea, Lung Congested, Kidney swollen	Chronic Respiratory Disease (CRD)
08	Haemorrhage in intestine, Clotted blood in intestine	Coccidiosis
09	Bursa swollen, Haemorrhage in thigh muscle, kidney enlarged, Button Ulcer in intestine, Haemorrhage in proventriculus	Infectious Bursal Disease + Newcastle Disease
10	Bursa swollen, haemorrhage in thigh muscle, kidney enlarged, haemorrhage in cecum, haemorrhage in intestine, blood in faces	Infectious Bursal Disease +Coccidiosis
11	White faces around anus, liver haemorrhage, Air sacculitis, Peritonitis, Salpingitis	Salmonellosis+ Colibacillosis
12	Haemorrhage in Trachea, Lung Congested, Kidney swollen, Bursa Swollen	Chronic Respiratory Disease + Infectious Bursal Disease
13	Haemorrhage in intestine, Clotted blood in intestine, Peritonitis, Perihepatitis	Coccidiosis+ Colibacillosis
14	Haemorrhage in Proventriculus, Button Ulcer in intestine, Comb &wattle swollen, Caseous fluid in Infraorbital cavity, haemorrhage in trachea	Newcastle Disease+ Infectious Coryza (IC)
15	Pericarditis, Perihepatitis, liver swollen, Air sacculitis, haemorrhage in trachea	Chronic Respiratory Disease + Colibacillosis

Fig 1a: Enlargement of Bursa (Infectious Bursal Disease)

Fig 1b: Pin point haemorrhage in proventriculus (Newcastle Disease)

Fig 1c: Pericarditis and perihepatitis (Colibacillosis)

Fig 1d: Soil in vent region (Salmonellosis)

Fig 1e: Haemorrhage in Cecum (Coccidiosis)

Fig 1f: Haemorrhage in trachea (Chronic Respiratory Disease)

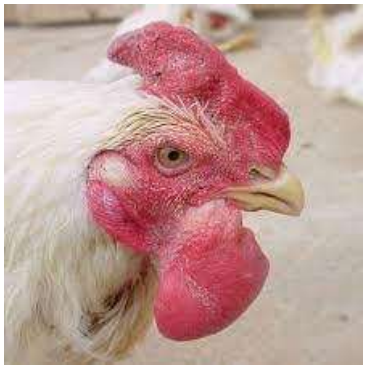

Fig 1g: Swollen of comb and wattle (Fowl Cholera)

Fig 1h: Caseous mass in Infraorbital Sinus (Infectious Coryza)

Statistical analysis: The data was imported in excel-2007 and cleaned accordingly. Descriptive statistic was done using software STATA/IC-16.0.

CHAPTER 03

RESULTS

A total of 100 prescriptions were collected where three different types of poultry are involved. the percentage clinical diseases of broilers are almost 89%, layer 9% and Sonali 2%. This are presented below by pie chart (Fig 2):

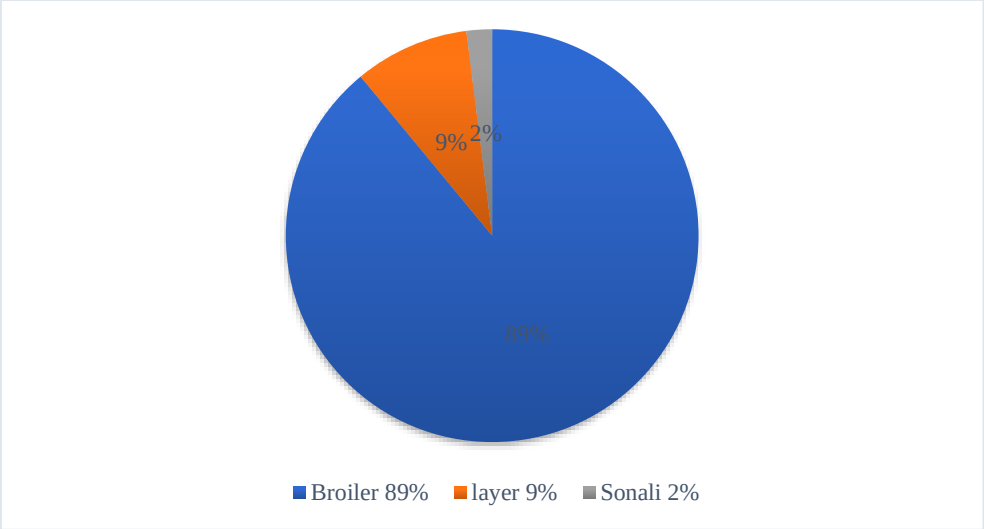

Fig 2: Pie chart of types of birds

Percentage of Clinical Diseases:

Table 02: Percentage of Clinical diseases among 100 cases

Serial No.	Clinical Diseases	Percentage
01	Infectious Bursal Disease (IBD)	21%
02	Coccidiosis	20%
03	Colibacillosis	10%
04	IBD+ND	08%
05	Necrotic Enteritis (NE)	05%
06	Salmonellosis + Colibacillosis	05%
07	Newcastle Disease (ND)	04%
08	Chronic Respiratory Disease (CRD) + IBD	04%
09	Salmonellosis	04%
10	IBD + Coccidiosis	04%
11	Chronic Respiratory Disease (CRD)	03%
12	ND+IBD	02%
13	Colibacillosis + NE	02%
14	CRD+ Colibacillosis	02%
15	Coccidiosis+ Colibacillosis	02%
16	IC+ND	02%
17	IBD + Colibacillosis	01%
18	Fowl Cholera (FC)	01%

Overall prevalence of Infectious Bursal Disease (IBD) is 21%, Coccidiosis is 20%, Colibacillosis is 10%, Necrotic enteritis is 5%, mixed infection of IBD and ND is 8%, and other clinical diseases have a frequency of less than 5% (Table 02).

Types of antibiotics use:

Ten different types of antibiotics were found among the 100 prescriptions. Most of the farmers are multidrug users. Our survey found that levofloxacin, ciprofloxacin, enrofloxacin, doxycycline, amoxicillin, gentamycin, norfloxacin, sulpha drugs, doxycycline, and colistin sulphate are being used on the farm. The percentages of these antibiotics' usage pattern are shown in (Figure 03).

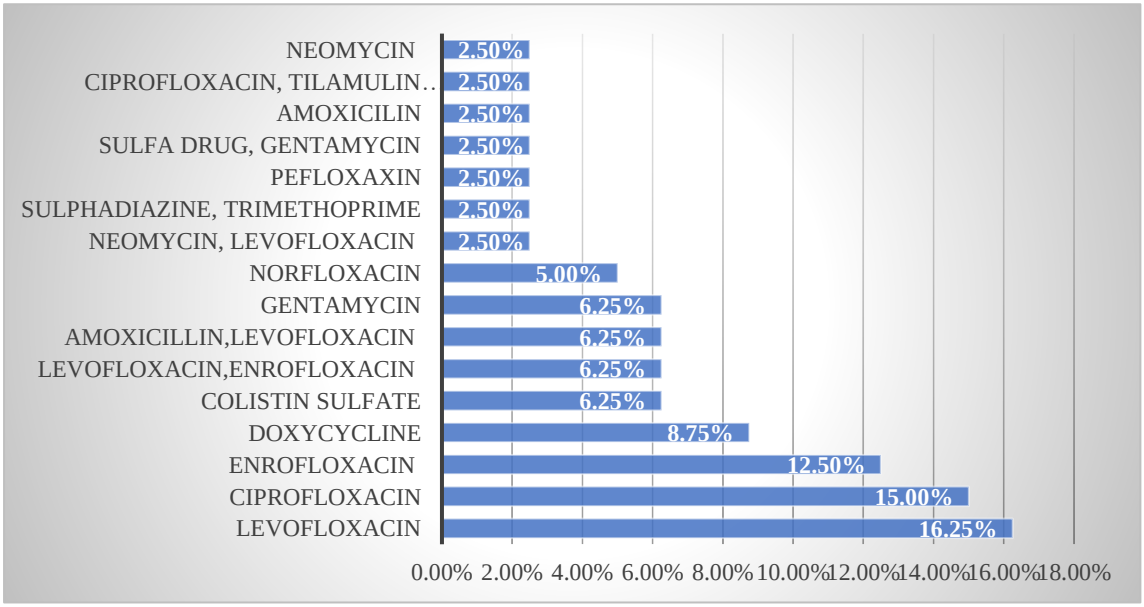

Fig 03: Percentage of antibiotics used in different clinical diseases

The most common antibiotics in collected prescriptions were antibiotics such as levofloxacin is 16.25%, ciprofloxacin 15%, enrofloxacin 12.50%, doxycycline 8.75%, colistin sulphate 6.25%, gentamycin 6.25%, norfloxacin 5% and combination of amoxicillin and levofloxacin 6.25%, enrofloxacin and levofloxacin 6.25% and others are less than 3% (Fig 3). Use of levofloxacin is increasing more inn different clinical diseases of poultry now a days in comparison to ciprofloxacin. Among them, colistin sulphate and gentamycin is not FDA-approved antibiotic for broilers in many countries due to lessen the prevalence of resistant bacteria.

Percentage of Antibiotics used in IBD and Colibacillosis:

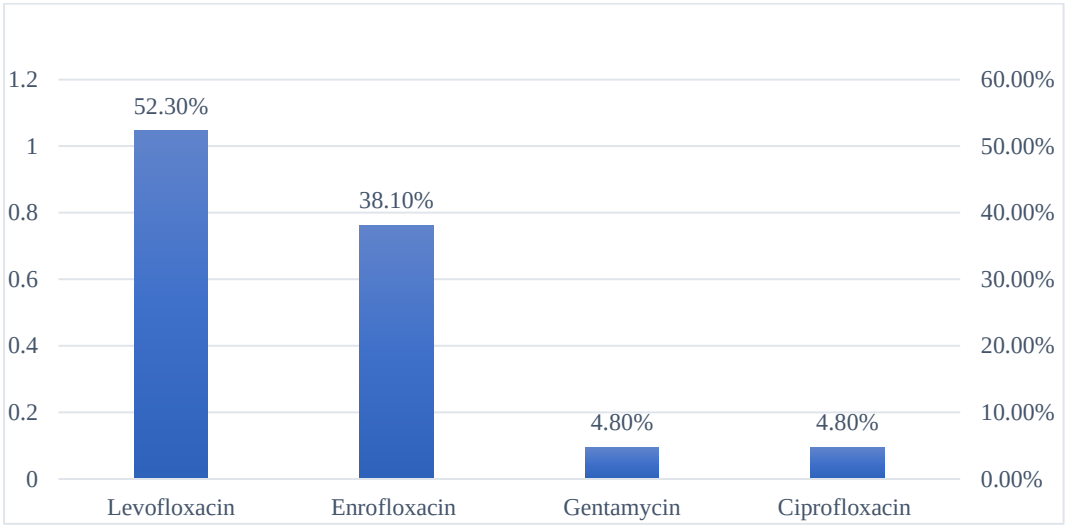

Fig 04: Percentage of Antibiotics used in IBD

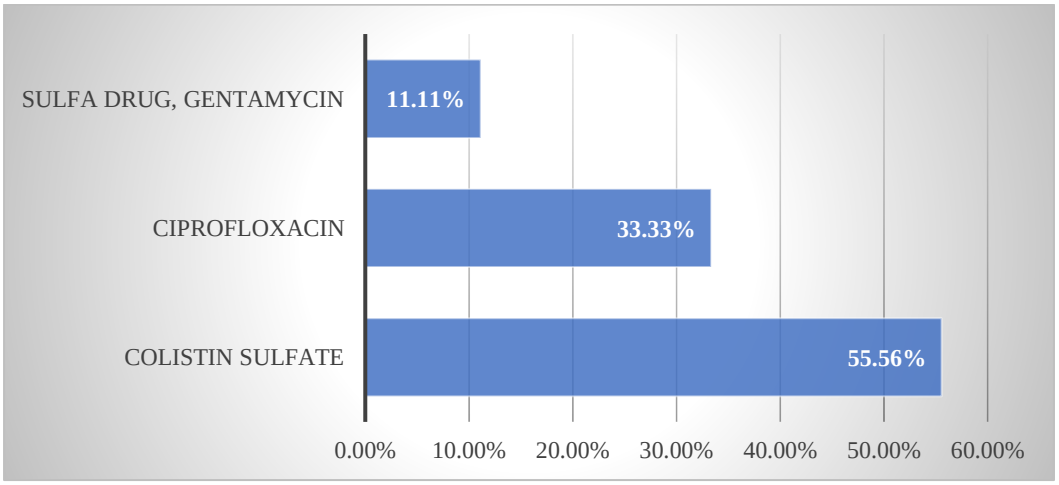

Fig 05: Percentage of Antibiotics used in Colibacillosis

The prevalence of Infectious Bursal Disease (IBD) and Colibacillosis is very common in Sitakunda upazila. In this study, among 100 cases the disease percentage of IBD is 21% and Colibacillosis is 10% where the use of antibiotics in case IBD, levofloxacin used as 52.30%,

enrofloxacin 38.10% and gentamycin and ciprofloxacin are 4.80%. In case Colibacillosis, colistin sulphate used as 55.56% and ciprofloxacin 33.33% and sulpha drug and gentamycin combined as 11.11% (Fig 5).

Percentage of Anticoccidial drug used in Coccidiosis:

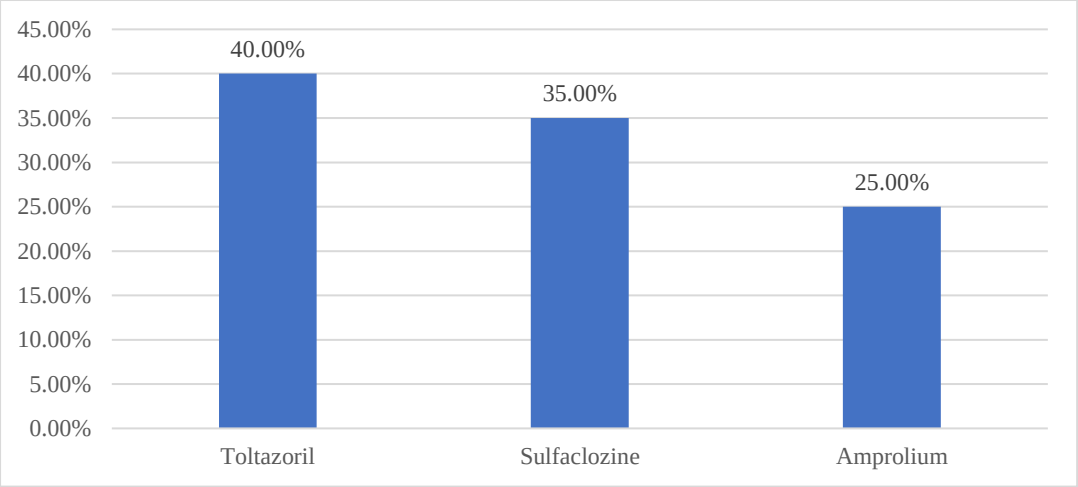

Fig 06: Percentage of anticoccidial drugs used in Coccidiosis

In case of Coccidiosis, Anticoccidial drugs such as toltrazuril used as 40%, sulfaclonazine 35% and amprolium 25% (Fig 6). Toltrazuril used more frequently in Sitakunda upazila than the other anticoccidial drugs for the treatment of coccidiosis.

CHAPTER 04

DISCUSSION

In a small-scale broiler farm in Bangladesh especially Sitakunda upazila of Chattogram district, we studied farmers' perceptions on antibiotic use. Since we only considered broiler farms that is why our sample size was relatively small. In a few cases, farmers were unwilling to cooperative to the surveyor and were not included in the survey.

The majority of small-scale layer farmers are skilled, but only a few take the essential precautions to minimize residue. About 80% of farmers are aware of drug shelf life because they want the optimum antibiotic action for their broilers, yet practically all of them do not adhere to the withdrawal period (Roess *et al.*, 2013). Farmers claim that no veterinarian informs them of the withdrawal time, and some believe that government veterinarians are uncooperative and difficult to assess (Imam *et al.,* 2020). Although veterinarians are aware of the withdrawal period and residual knowledge, they do not increase awareness because the country's socioeconomic restraints, which include the lack of insurance and government support for farmers who lose their businesses (Sirdar *et al.*,2012). And those who are aware of the withdrawal time (5.83 % of farmers) do not adhere to it while selling the birds (Wadoum *et al.*, 2016).

In our study, almost all of the farmers use antibiotics on their farms. This finding is consistent with findings from other studies that show a significant use of antibiotics in poultry production to control the source of infection in farms caused by inadequate management. It was clear that a lot of farmers were using antibiotics as a therapeutic and prophylactic treatment, and that they were using them more frequently during disease outbreaks (Ferdous *et al.*, 2019). About 20% of farmers use antibiotics on a daily basis for no apparent reason. Antibiotics are prescribed by registered veterinarians and non-veterinarians for the majority of farms, but 18.34 percent of farmers use antibiotics of their own choosing and based on experience because antibiotics are easily and illegally available through unregistered pharmacies and dealer shops (Afakye *et al.*, 2020). All farms applied multiple antimicrobials to poultry throughout the production cycle, including banned antimicrobials such as colistin sulphate (Kalam *et al.*, 2021). Therefore, educating farmers alone will not be enough to minimize any misuse of antimicrobials (Kalam *et al.,* 2021). Antibiotic indiscriminate abuse can be reduced by enhancing veterinarian

accountability, implementing a training program, and raising public knowledge and monitoring (Sarwar *et al.,* 2018). The quality of antibiotics differs from one pharmaceutical to another. Antibiotics of poor quality are unable to kill an entire bacterial population. As a result, there is a risk of AMR (Agyare *et al.*,2018). Dishonest doctors, persuaded by pharmaceutical companies' seductive marketing strategies, may prescribe antibiotics of inferior quality. Besides the knowledge and attitudes of farmers toward AMU and AMR were strongly linked to layer farmers having medium-sized farms compared to their smaller counterparts. Layer farming needs a more extended period to reach the production level, and farmers invest more money to get more benefits. On the contrary, in broiler farming, less time and less investments are required, where farmers get back their investment and profits within a short period (Hassan *et al.,* 2021). Moreover, few farmers prescribe antibiotics for their flock instead of seeking a veterinarian's advice, which may result in the use of low-quality antibiotics (Clifford *et al.*,2018). The wider picture is that there is a dearth of public health education, food safety outreach programs, and law and legislation enforcement.

CHAPTER 05

CONCLUSION

Antibiotic usage in the poultry sector and production in Bangladesh is shockingly imperfect, according to available to the public, verifiable data. More than 90% of farmers have a high school degree, and the majority of them are aware of the drug's shelf life and are compelled to complete the course, but they disregard the withdrawal period. All small-scale layer farms employ many drugs, with prescriptions from veterinarians, non-veterinarians, or even self-medication. Different antibiotics of various classes were found in such farms, including vitally needed medicines and antibiotics used as a last option by humans and should not be used until absolutely necessary. It's to responsible for the rise of antibiotic resistance in the biodiversity. Strict biosecurity, intense extension, education programmes, and government legislation on responsible antibiotic use could lead to a ban on antibiotics to be used indiscriminately in Bangladesh's broiler farms. As a result, National Residue Control Programs should be implemented. Farmers, veterinarians, antibiotic sellers, and other stakeholders should be informed and educated on the use of antibiotics and the risk of AMR. These sectors must cooperate to promote responsible use and best practices.

CHAPTER 06

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CHAPTER 07

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